The Glass Industry

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Vol. 5 APRIL, 1924 No. 4

The Fourcault Process of Drawing Sheet Glass at Clarksburg

A description of the process and the new plant of The American Sheet Glass Company

A large plant equipped for the manufacture of sheet glass by the Fourcault system, a process which embodies revolutionary ideas and employs methods of unusual interest, has been built and put into operation by the American Sheet Glass Company at Clarksburg, West Virginia,

The American Sheet Glass Company is capitalized at $500,000. H. B. Curtin of the Pardee-Curtin Lumber Company of Clarksburg, is president. H. E. Travis, treasurer and general manager of the company, has long been identified with and is highly regarded throughout the glass industry. He was formerly owner and manager of the Travis Glass Company of Clarksburg, which was absorbed by the Thatcher Manufacturing Company.

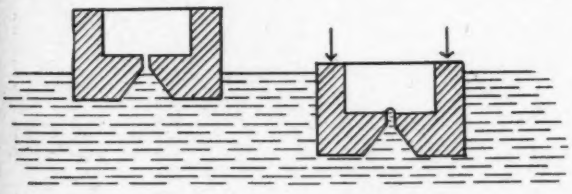

FIG. 1—SHOWING THE EFFECT OF DEPRESSING THE SLOTTED DRAWING BLOCK.

The contract for the engineering and construction work for the entire plant which represents an outlay of approximately $500,000 was awarded to the Simplex Engineering Company of Washington, Pa., on August 24, 1923. The work of tearing down the old factory and clearing the site began on August 26. The tank fires were lighted on December 31, 1923, and the plant was ready to begin operations on February 1. A crew of workers of long experience with the Fourcault process in Europe were brought here to assist in the operation of the plant, but time was required for training other and inexperienced workers so the beginning of operations was delayed until March 9, when the first glass sheet was drawn.

The Fourcault process, invented by Emile Fourcault of Belgium and patented by him in 1901 was, after many years of experimentation and development, put into commercial operation on a large scale in 1914 at the Verreries de Dampremy, near Charleroi, Belgium, where the experimental work had been done. Eight machines were installed and operated throughout the war period and up to the present time. Other installations of the Fourcault process are in operation in Belgium and in several other European countries.

In the United States very little was known of the earlier developments and progress of the process and due, no doubt, to the war, very little interest was shown in it. After the armistice, however, when the fact became widely known that the process had been in successful and profitable operation abroad for several years, interest was gradually aroused and eventually arrangements were made to introduce the process into the United States. Today there are two American factories which have actually begun the production of flat glass by the Fourcault method, and several others nearing completion.

The Process

The principles upon which Fourcault based his invention were explained in an article printed in the August, 1921, issue of THE GLASS INDUSTRY. They will be referred to only briefly here. The foundation of the system is the principle illustrated diagrammatically in Fig. 1. Place in a tank of molten glass a slotted refractory block made of material of lesser density than that of the glass and shaped approximately as shown in the diagram with the upper lips of the slot at a lower level than the top and outer edges of the block, and it will float with the lips of the slot higher than the surface level of the molten glass. If pressure from above be applied to the upper surface of the floating block (called in the Fourcault process, the "debiteuse" or drawing block) and the block be immersed in the glass to a point where the upper edge of the slot lies below the level of the surface of the glass, the pressure from the glass surrounding the block will cause some of the glass to flow upward through the slot, toward the same level as the surface of the main body of glass.

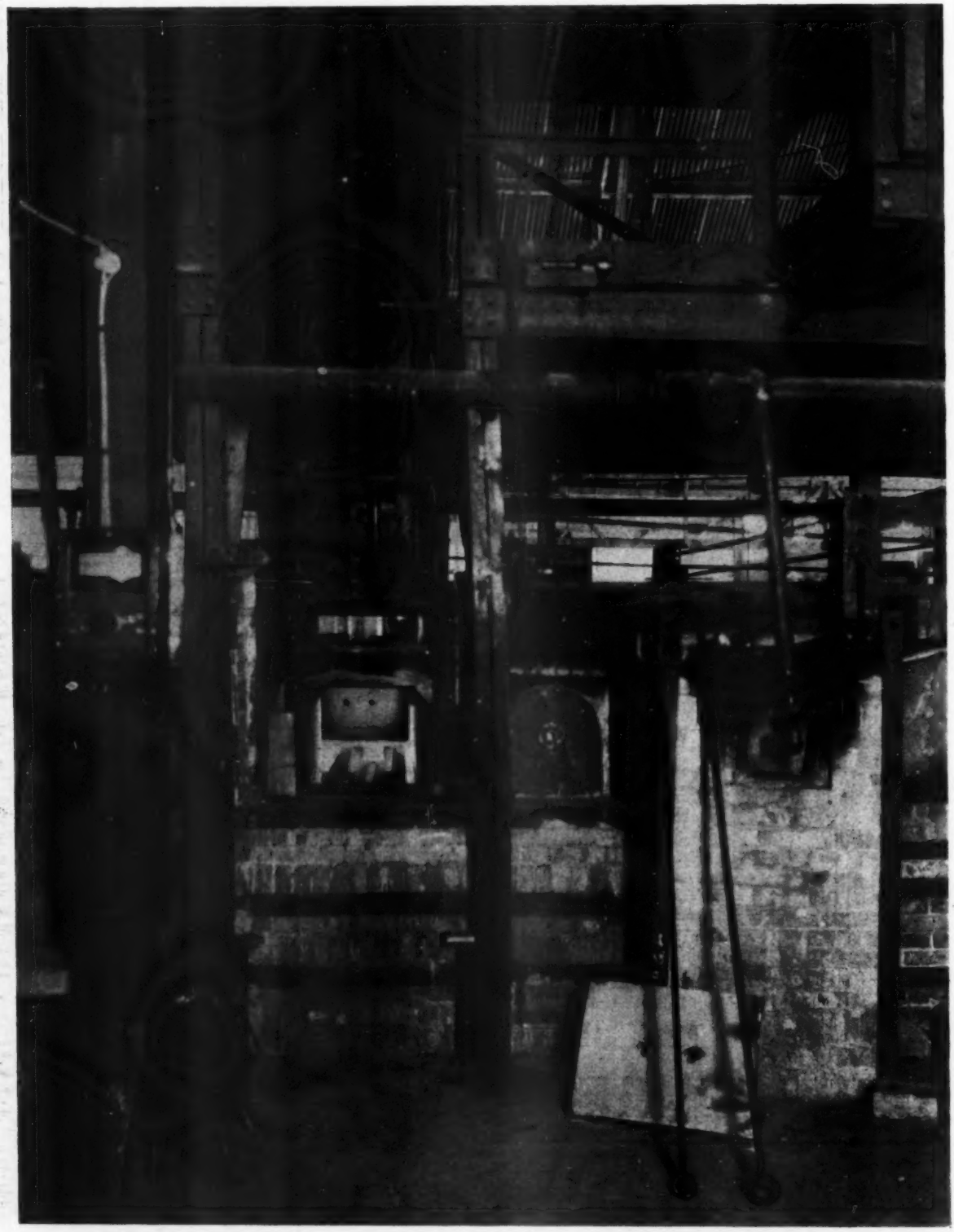

FIG. 2—A FOURCAULT DRAWING MACHINE.

Showing block removed from drawing chamber opening and refractory drawing block floating on top of the glass, ready for the depressing rods to be placed in position and for drawing operations to begin. Each machine has an individual heating chamber in which the temperature is controlled independently of all other machines.

The Fourcault idea is simply to remove this upward-flowing glass from the top of the slot at exactly the same rate as it comes through from the bottom. This results in a continuous flow of glass, kept up as long as the relative position of the drawing block to the surface of the glass is maintained. Incidentally, it will be observed that the word "drawing" as applied to the operation may be considered a misnomer, as the process basically is a flowing process; the glass flowing upward through the slot is simply following natural laws and, up to a certain point, not responding to applied mechanical force.

The Machine

The glass must be taken away from the slot as fast as it comes through or it would, of course, become cool and stop

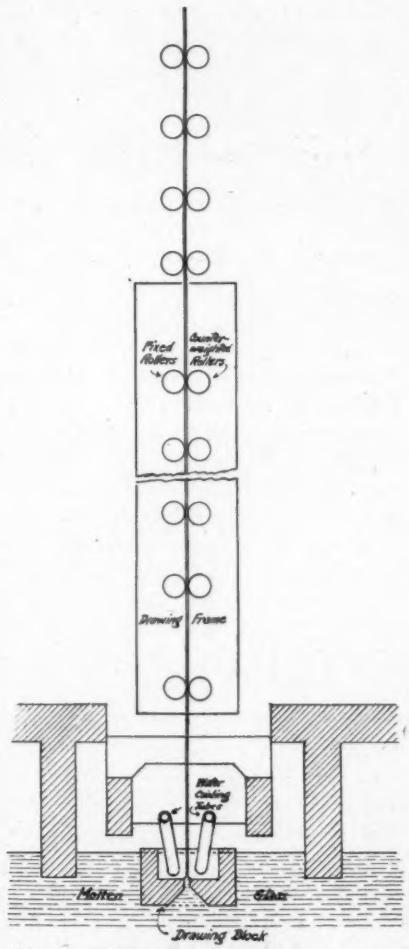

FIG. 3—ESSENTIAL FEATURES OF THE FOURCAULT METHOD.

the flow. The apparatus devised by Fourcault for removing the glass from the slot in the form of a continuous sheet is simple in the extreme, as will be perceived from the following description and the accompanying photographic views taken in the factory of the American Sheet Glass Company.

Primarily, the Fourcault drawing machine consists, as indicated on the diagram, Fig. 3, of a vertical series of asbestos covered steel rollers placed in pairs over the working furnace, directly above the drawing block. The sheet of glass carried up from the tank passes between the rollers of each pair in turn. The lifting force is transferred from the rollers to the glass by means of friction, the glass being in close contact with both rollers all the way across the sheet. Each pair of rollers is geared together. The rollers on one side of the sheet of glass revolve in fixed bearings, but on the other side means are provided for slight horizontal adjustments of the rollers to take care of different thicknesses of glass. Each of them is counterweighted, as shown in the photographs, in such a way as to cause just enough pressure on the glass to prevent it from slipping and keep the sheet moving upward without interruption. The rollers are spaced vertically about a foot apart except at points where deflectors or baffle plates are situated, as explained further on, where the distance between rollers is increased to make room for the deflectors.

The entire drawing frame or channel consisting of 15 pairs of rollers is, with the exception of the four upper pairs, enclosed in a box-like structure of steel plates with an asbestos lining. Inside, at certain points, two steel plates extending horizontally the full length of the rollers are placed with their upper edges close under the rollers, their upper surfaces inclining downward and outward to the sides of the frame. These baffles or deflectors help to retain heat in the drawing frame and also serve, in the event of the glass sheet being broken, to catch the pieces and prevent them from falling below into the drawing pit. Hinged doors placed at close intervals in both sides of the frame afford easy access for inspecting the glass at any point on its upward course, and for examining and replacing rollers or removing broken glass.

The rollers are driven by a system of gears placed, for convenience when lubricating or making repairs, on the outside of the drawing machine. In the Clarksburg plant, power for each drawing machine comes from an individual 3 H. P. General Electric motor connected with a Reeves variable speed transmission. By means of a simple device the speed of the lifting rollers is regulated by the operator from a point close to the drawing machine itself. Close control and perfect regulation of the speed is essential as the thickness of the glass sheet depends upon the speed of the rollers.

The first or lowest pair of rollers is about 3 ft., 6 in. above the surface of the glass in the furnace. The enclosed part of the drawing machine extends upward from a point a few inches below the first pair of rollers for a distance of about 22 feet. The top end is covered with two loose steel plates or dampers by which the temperature inside the machine may be regulated. Several small gas jets are located at intervals between the rollers to assist in heat regulation.

The four upper pairs of rollers extend above the top of the enclosed section of the machine and rise through an opening in the floor of the cutting room overhead for a distance of about 4 ft., as shown in Fig. 7, making the total length of the machine about 30 feet.

Annealing

The Fourcault process dispenses with the ordinary lehr, no annealing of the glass or other heat treatment than that received during passage through the drawing machine being required. The glass, not having undergone alternate cooling

and re-heating operations, as is the case where other methods are used, but having cooled slowly and uniformly while being drawn to the top of the machine, emerges in proper condition for immediate cutting and shipping.

Method of Operating the Machine

The procedure followed at the Clarksburg factory when the machine is put into operation is, first, to float the drawing block into working position in the drawing pit, directly below the lifting rollers and with the slot in the block in exact alignment with them.

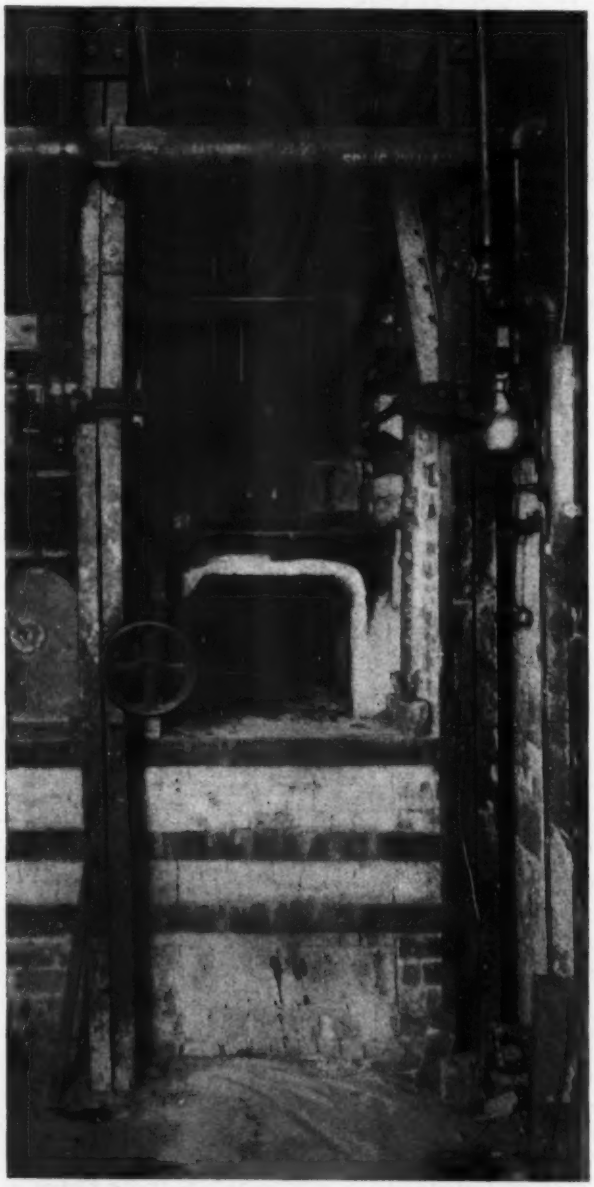

FIG. 4—LOWERING THE BAIT THROUGH THE SLOTTED DRAWING BLOCK.

Looking into the drawing pit the descending bait may be seen as it approaches the slotted drawing block, its edge faintly outlined at the middle of the opening. Near the right side of the opening one of the vertical rods used for depressing the drawing block is shown, its lower end resting on the upper surface of the block. The handwheel in the foreground near the left pillar operates the four depressing rods, two at each end of the drawing block. A short distance above the handwheel and fastened to the steel post is the device connected with a motor and variable speed transmission by which the operator regulates the speed of the lifting rollers.

Four heavy steel bars arranged in upright positions, one near each corner of the drawing frame, are lowered until their rounded ends rest upon the upper surface of the drawing block. Means are provided for raising and lowering the rods a limited distance; the turning of a hand wheel (shown at the left of the machine in Fig. 4) forces the four rods downward and applies pressure to the drawing block at its four corners.

The bait, consisting in this case of a frame-work of the same width as the rolls and made of thin steel bars with a fringe of common nails dangling from its lower edge, is then inserted between the upper pair of rolls at the top of the machine, the rolls are set in motion in the direction opposite to normal and the bait travels slowly downward into the glass. More pressure is then applied to the rods resting on the drawing block, causing the latter to become deeply enough immersed in the glass to bring the upper lip of the slot below the level of the surface of the glass, whereupon glass begins to flow upward through the slot. The lifting rolls are then put into action and the bait with the glass clinging to it is slowly raised, forming as it rises a sheet of glass the full width of the bait and perfectly flat.

A portable water-cooling device in the shape of a wide flattened tube is placed just above the drawing block on each side of and close to the slowly rising sheet. The glass sheet in its passage to the first pair of rolls, about 3½ feet above the drawing block, becomes so well cooled that it passes between the rolls without receiving any marks whatever from them and with both of its fire polished surfaces undamaged.

At the top of the machine the bait is broken off and the sheet, about to be cut, is allowed to pass as far above the upper pair of rolls as is necessary to give it the desired length, without making it too long to be conveniently handled. A narrow strip of wood, supported on the drawing frame is then swung against the glass sheet near the level of the cutting platform and the glass is cut across by hand and removed to the racks. Two large electric elevators are used for conveying the racks to the cutting room on the ground floor of the adjoining building. The cutting and packing room is about 200 feet square and contains 21 stalls. Adjoining it at one side is the warehouse and next to that the box factory.

For keeping the drawing block and pit clean, blowing away bits of broken glass, and for general purposes, air at 5 pounds pressure is furnished by a General Electric centrifugal compressor, type T, of 350 cu. ft. displacement capacity and speed of 3,450 R.P.M. It is driven by a direct connected G. E. induction motor, type 141, 220 volts, 3 phase, 60 cycle. This compressor occupies but one-third of the floor space that would be required for a reciprocating type compressor of equal capacity and is said to cost one-third less to operate.

The Clarksburg Installation

What has been said above concerning the Fourcault invention applies mainly to the principles, construction and operation of a single machine. In plants conducted on a commercial scale it is usual to group several machines together at one furnace. At the Clarksburg plant of the American Sheet Glass Company there are eight machines, placed

FIG. 5—INTERMEDIATE GALLERY OVER WORKING FURNACE DURING ERECTION OF DRAWING MACHINES.

FIG. 6—FRONT VIEW OF PART OF THE WORKING FURNACE.

Over the furnace is the intermediate gallery. The lamps in the upper left-hand corner of the picture hang from the floor of a gallery which carries the motors and variable transmission equipment that operates the drawing machines.

in a straight row over the working tank, which lies at right angles to the melting tank and makes with it and the connecting canal a T-shaped structure. Four of the drawing machines, spaced about 9 feet 4 inches center to center, are grouped on each arm of the working tank, the two groups being separated by a cooling chamber which receives the glass from the melting tank through the canal connecting the two tanks.

The Melting and Refining Tank

The main tank, approximately 23 feet wide, 75 feet long and 5 feet deep represents the latest American practice in window glass tank design. The melting and working tanks are both of the regenerative type. Natural gas is the fuel used.

On the site of this new glass works there formerly stood the buildings and furnace of the Liberty Glass Company. Before construction of the new Fourcault plant was begun by the general contractors, the Simplex Engineering Company, the old building with the exception of the part covering the tank was demolished and a modern steel building with concrete floor was added to house the working tank and drawing machines.

The round working end of the old tank was torn out and rebuilt, new ports were constructed and the former working end became the melting end of the new tank. But little of the old tank was utilized; it was practically all rebuilt, with the exception of the steel work.

The new tank is air-cooled by means of a type F. Sirocco blower made by the American Blower Company and driven by a General Electric 220 volt, 3 phase, 60 cycle induction motor.

The Working Tank

The working tank is approximately 6 ft. 6 in. wide, 105 ft. long and 3 ft. deep. Above the glass line the long tank is divided into separate chambers, one for each machine, by means of bridges built into the masonry and sub- or underbridges floating in the glass. These form walls extending from the top of the furnace to below the glass line, effectually isolating the upper part of each compartment from the others, preventing the transfer of heat between adjoining compartments and making possible very close regulation of the temperature for each machine without regard to the requirements of the other machines and completely independent of them. It thus is made possible to draw glass of different thicknesses and requiring different roller speeds and temperatures, in adjoining chambers. This is accomplished without interfering in any way with the flow of glass in the lower part of the tank, where it has a clean sweep under all the compartments. To aid in keeping the glass in good condition there is a flow spout at each end of the working tank for use when required.

To assist in maintaining the temperature in the compartments at the desired degree, each of the individual chambers from which the glass is drawn is fitted with four gas burners, two at the front end and two at the back. Every twenty minutes, synchronous with the main tank, the flow of gas is

FIG. 7—WHERE THE FINISHED SHEETS COME THROUGH.

As the continuous sheet of glass rises above the top pair of rolls it is cut to proper length by the men at the rolls and carried by the men on the platforms to the racks.

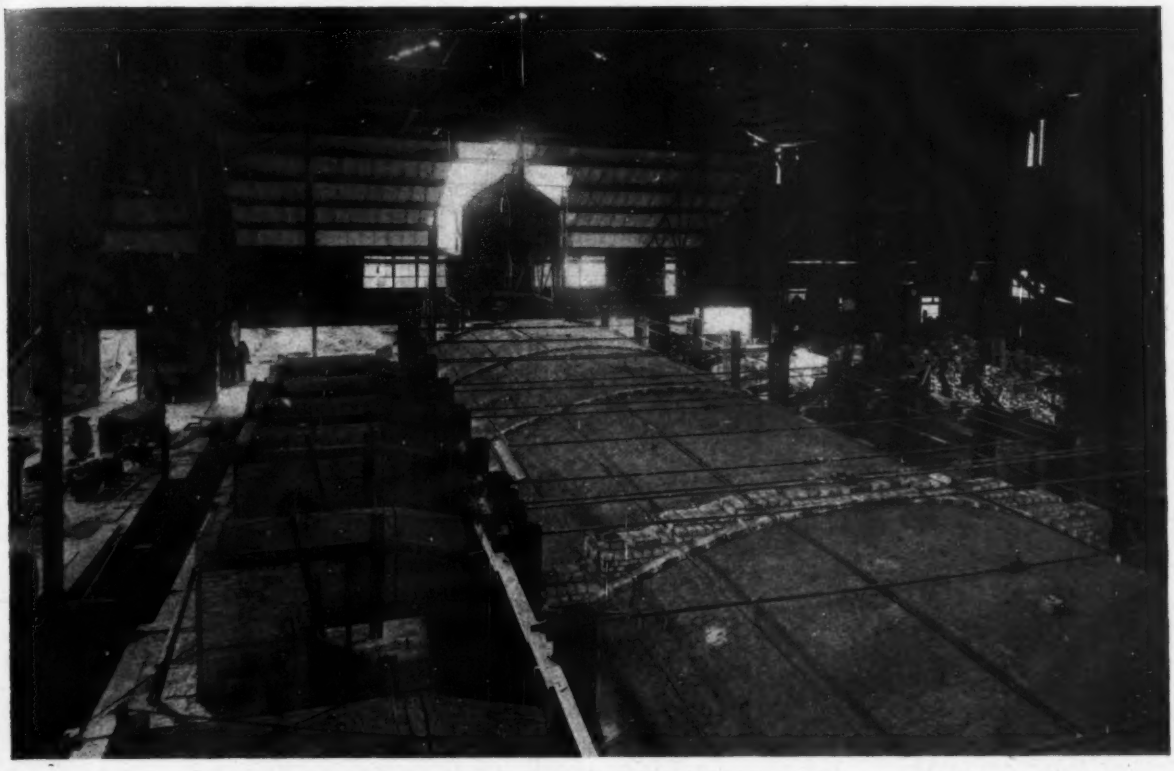

FIG. 8—TANK AND MIXED BATCH STORAGE BIN.
Photographed when nearing completion.

FIG. 9—FILLING-IN END OF TANK.
The swinging doors at each side of the dog-house are a popular innovation, obviating the necessity of removing and replacing a heavy block every time an inspection of the interior is made.

reversed. A separate gas supply is provided for each of the two groups of drawing chambers. The gas is distributed to the two groups through two identical systems of overhead piping.

The Pyrometer System

Furnace temperatures throughout the entire plant are measured by Brown pyrometers, manufactured and installed by

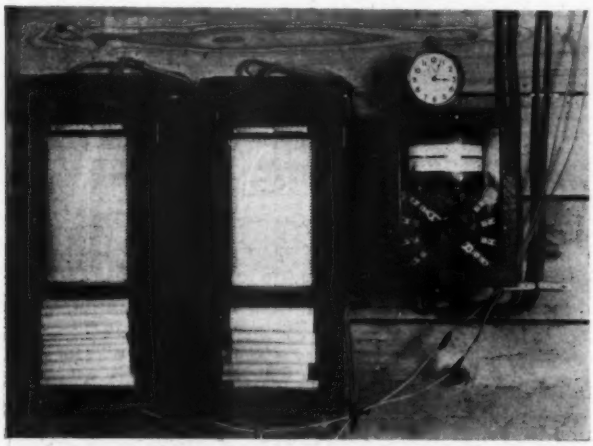

FIG. 10—DUPLEX RECORDING PYROMETERS AND INDICATORS FOR MAIN TANK.

the Brown Instrument Company, Philadelphia. Along the crown of the main tank there are spaced four platinum thermocouples 18 inches long, indicated at A in the diagram, Fig. 12. They are protected in both primary and secondary protecting tubes. The temperatures measured by these four instruments are shown on an indicating pyrometer with 4-point switch (C in the same diagram) and are recorded on two duplex recording pyrometers (B), each making a continuous record of the temperatures of two thermocouples on separate sides of a double chart, over a period of approxi-

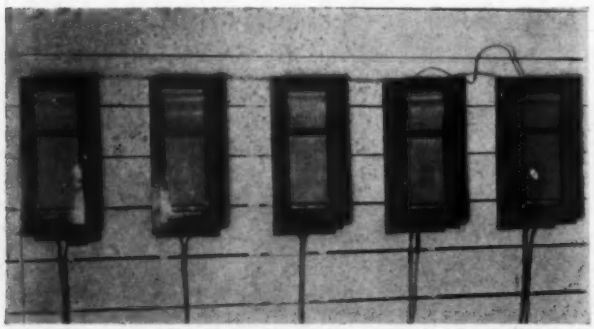

FIG. 11—DUPLEX RECORDING INSTRUMENTS FOR WORKING TANK AND CANAL.

Each instrument makes continuous records of the temperatures of two thermocouples, on separate sides of a double chart.

mately two months. These instruments are driven by Warren electric clock motors.

Similar thermocouples are installed at the canal and cooling chamber and one is placed in each of the individual heating chambers of the working tank. Temperatures at these points are indicated and recorded by instruments like those used on the main tank. The temperature at the back of the melting tank is maintained at 2540 to 2560 deg. F. Just back of each drawing machine the temperature runs from 1800 to 1900 deg. F.

Another indicating pyrometer with 2-point switch (not shown in diagram) serves two furnaces situated a short distance from the main tank, which are used for heating up floaters, underbridges, drawing blocks, etc.

All of the instruments are graduated 0-3000 deg. F. An interesting feature of an installation of this kind, especially in a glass plant where the radiated heat from the furnaces creates such great variation in atmospheric temperature, is that all the instruments, both indicators and recorders, embody Brown automatic cold junction compensation, including compensation for temperature co-efficient of the instruments and means of zero adjustment. This feature was patented

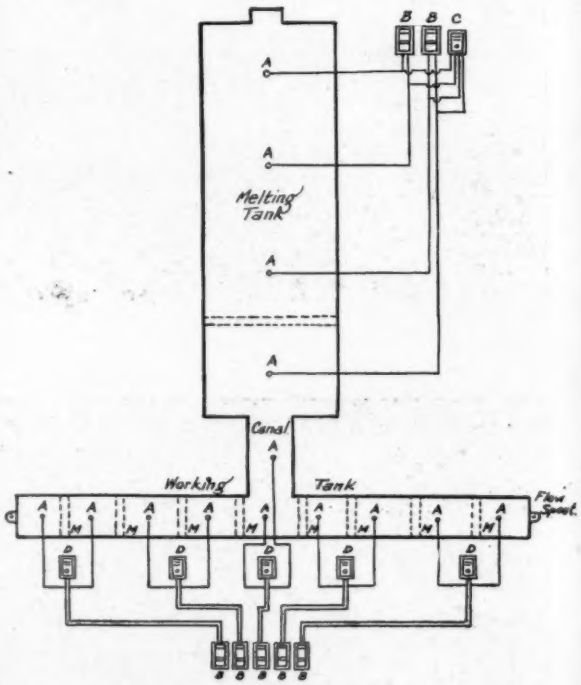

FIG. 12—DIAGRAM OF MELTING AND WORKING TANKS.

Showing instrument layout and wiring of pyrometer system.

December 28, 1920, and is licensed under patent No. 869,-668.

This means, it is claimed, that the instruments read correctly no matter what temperature changes may occur at the cold junction, along the wiring or even within the instrument, and the bother and uncertainties of burying the cold junction in a cold well in the ground or of placing it in an electrically heated box, are entirely done away with.

Batch Storage and Handling

A soda-lime batch, somewhat similar to that used in other sheet glass drawing processes is used. Two Wiederholdt storage bins, shown in Fig. 14, one of 20 carloads capacity for sand and the other divided into three sections for soda ash, salt cake, and lime, have been constructed. A modern batch handling system, not entirely completed at the time the accompanying photographs were taken, is provided. It is

FIG. 13—INTERIOR OF MELTING TANK.

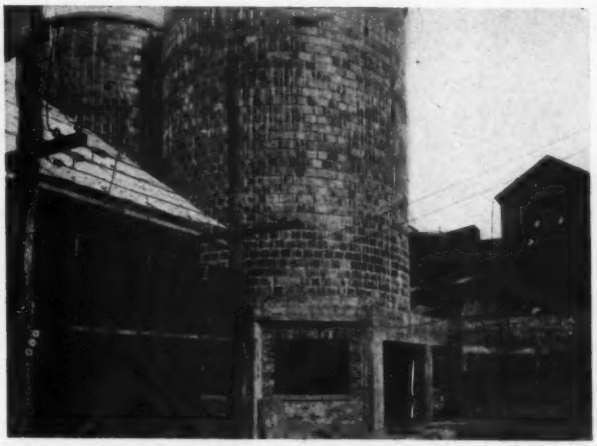

FIG. 14—WIEDERHOLDT RAW MATERIALS STORAGE BINS.

FIG. 15—SIROCCO BLOWER DRIVEN BY G. E. INDUCTION MOTOR
For tank air-cooling system.

FIG. 16—TRAVELING BATCH MIXER.

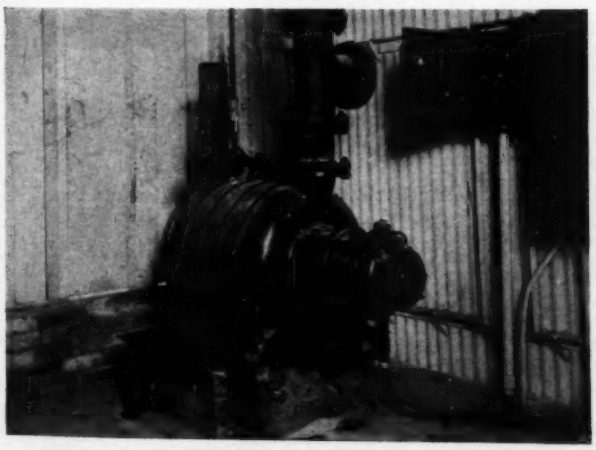

FIG. 17—GENERAL ELECTRIC CENTRIFUGAL COMPRESSOR.
Driven by direct-connected G. E. induction motor.

FIG. 18—STORAGE BIN FOR MIXED BATCH AND CULLET.
With batch charging car suspended below from rails.

designed to handle the raw materials automatically from freight car to furnace. Clark shovels are provided for unloading the bulk materials from the cars to a chute leading to a pit, whence they are elevated 78 feet to the top of the bins by a belt bucket conveyor. From the bottoms of these bins the batch materials are weighed in proper quantities into a motor driven 3-ton capacity traveling batch mixer, which is operated by a motor and propelled by an electric trolley system to the boot of a bucket conveyor where the batch, now thoroughly mixed, is automatically dumped. It is then elevated to a belt conveyor which takes it to a mixed batch and cullet storage bin at the rear of the tank.

From this bin the batch is automatically weighed into a charging car that runs on an overhead track, and charged into the furnace mechanically. With this apparatus the proportion of batch and cullet can be changed at will as they are weighed separately in the charging car. A special conveyor is provided to carry cullet back to the storage bin.

Production Capacity

Four of the eight Fourcault machines in the Clarksburg plant draw sheets of 48 inches gross width, and the other four draw them 54 inches wide. At the sides of the sheets there are always strips of thick glass, necessitating the cutting-off of the border or selvage along each side making the net widths of the finished sheets, 44 inches and 50 inches respectively.

At the Clarksburg plant any thickness of glass can be drawn up to 44 ounce. The thickness of the sheet is determined by the speed of the lifting rollers. The faster the rollers revolve, the thinner will be the glass. A sheet of single strength glass is drawn at the rate of 30 inches a minute; double strength, about 18 inches; and triple strength, about 10 or 12 inches a minute. It is said that glass over half an inch thick has been made successfully on Fourcault machines in Europe. With its eight machines operating at capacity, the Clarksburg factory will have a production of approximately 1,000 boxes a day, 30,000 to 40,000 boxes a month, depending upon the thickness of the sheets.

Discussion on the Use of Pyrometers in Glass Works

At the February Meeting of the Society of Glass Technology

At the meeting of the Society of Glass Technology in Sheffield, England, on February 20, two sessions were held. In the morning there was an exhibition and demonstration of modern pyrometers at the Department of Glass Technology of the University. The following firms exhibited: The Bowen Instrument Co., Ltd.; The Cambridge & Paul Instrument Co., Ltd.; The Foster Instrument Co.; The Optical Pyrometer Syndicate. Messrs. Booth & Miller also demonstrated their new temperature controller.

At the afternoon session the subject under discussion was "The Use of Pyrometers in Glass Works." Five papers were presented.

The Use of Pyrometers in Glass Works

By E. A. Coad-Pryor, B.A.

The value of pyrometric equipment in a glass factory depended essentially on three factors:

1. The reliability of the pyrometer itself, particularly the clock-work;
2. The skill which is expended on its maintenance; and
3. The attitude with which the manageme[illegible] foremen and furnace operators regard the pyrometer.

Of these three the last was regarded as the most important. The pyrometer in no way displaced the trained eye; its real function was to supply further information in order that a highly skilled operator might be able to get more out of his plant than had hitherto been possible.

The range of temperatures to be measured could conveniently be subdivided into 3 groups.

1. The range 0 deg. to 700 deg. C., covering lehrs, stack temperature, producer gas, etc.
2. From 700 deg. to 1,200 deg. C., regenerator temperature, pot work, and
3. Above 1,200 deg. C., the temperature of the melting furnaces.

In the first group the thermocouple was the most convenient instrument to use. Some sort of a portable thermocouple should be part of every works equipment. A convenient couple for low temperature work was iron-constantan; the wire to be about 22 gauge.

In the high temperature ranges an optical or total radiation pyrometer was, as a rule, the most convenient. The tank furnace might be subdivided into three zones: The melting zone, the plaining zone, and the refining end. Two permanent pyrometers should be used on each furnace, one on the refining end, the other sighting through a hole in the end wall at the melting end of the furnace. The use of couples embedded in the wall of the tank or in the crown caused probably more trouble than they were worth.

The optical or radiation pyrometer if used with discretion, was the most reliable and the most easily applied. The author's experience was that the optical instruments gave less variable readings than did the radiation instruments. The all-important factor with any installation was the training of the staff and operators to use the instruments with intelligence as an aid to the maximum efficiency in furnace manipulation. A bibliography was added to the paper.

Continuous High Temperature Measurements in Glass Works

By W. M. Clark, Ph.B. (U. S. A.)

In the strictest sense of the term there was probably no absolutely accurate method existing for constantly determining glass house temperatures. We could only approach this desirable aim by refinements of installation and careful maintenance, and this meant both equipment and maintenance expense. Therefore, in considering the subject of a pyrometer installation the glass manufacturer must balance the factors of what his demands for accuracy will be worth against the initial and operating costs of various systems. It is always advisable to install both the indicating and recording type of instrument, side by side.

Experience at a number of modern well laid out plants showed that pyrometric measurements were reflected in the costs sheets. The morale of the furnace men was improved by eliminating the human errors of judgment in guessing at temperatures and cost per unit of output decreased. With improvements in pyrometric equipment the tendency was for their more extensive use around glass works. The depreciation on such equipment was not excessive, about ten per cent per annum being a fair amount, judging from successful installations, and as improvements came along they could be incorporated into the system, replacing features which became

obsolete and thus keeping the installation up to date. A well planned system would reduce overall costs in a year more than sufficient to pay for the investment and often would leave several times this amount if used intelligently.

The most forceful argument for the adoption of pyrometer control in a glass works was on the score of economic savings but the information thereby made available to the management and staff was also important in showing each man a tangible effect of his operation on the thermal conditions. The producer man saw that good gas was necessary to maintain temperature, the furnace man saw the result of proper draught regulation, the foreman of the finishing department could be satisfied whether the ware was being properly annealed and the whole schedule of production was benefited.

Recent Advances in the Design of Temperature Measuring Instruments, Etc.

By R. W. Whipple, F. Inst. P.

One difficulty in connection with disappearing filament pyrometers was to get two lamps which would be interchangeable. Methods for overcoming this difficulty were indicated. The speaker then said how greatly he had been impressed with what he had seen recently in the United States in the matter of automatic temperature control. He understood considerable work was being done in this connection in glass works and referred to the works of Messrs. Keuffel & Esser when lehr temperatures were controlled from 200 deg. C to 600 deg. C. For every kind of glassware a special cooling curve was followed. In the United Kingdom automatic temperature control was being developed. The main principle in such control was a galvanometer needle which was deflected by some method. Lantern slides were then exhibited showing various forms of controller including (1) Brown, (2) Bristol, (3) C. Engelhard, (4) Leeds & Northrup, (5) Cambridge, (6) Barr, (7) Althorpe. It should be possible to control lehr temperatures by some such automatic control apparatus, and so to lessen the worries of the works manager.

Practical Applications of Pyrometers to Glass Works

By C. E. Foster, F. Inst. P.

Both optical and total radiation instruments were calibrated for what were known as "black body" condition and when used on hot bodies which were not technically what were known as "black bodies," the reading would be in error by an amount which varied with the actual condition. An ordinary large glass melting tank was by no means a "black body." The author suggested that luminous gas flames might have the power of selective emission, that is, they radiated a light which was not in proportion to their temperature, but might be of an intensity which would correspond to the brightness of a solid hot body at a much higher temperature. Considering a surface of molten glass viewed obliquely in a furnace that did not realize "black body" conditions, it obviously had a considerable reflecting power, but he found that its reflecting power as experienced in measuring with a total radiation pyrometer was relatively much less than the unoxidized surface of molten metal. Further consideration showed that this was reasonable because there was some considerable transparency in the glass so that it would actually emit a greater proportion of the heat from inside. Thus it was actually found that molten glass approached more nearly to a true "black body" than unoxidized molten metal.

Reflections on Pyrometer Design

By W. Bowen

The value of pyrometers to heat-treatment problems was now too well recognized to need discussion. A few of the standards which a good pyrometer should fulfill were as follows: (a) simplicity of design and operation, (b) robustness and freedom from liability to breakdown under shock or accident, (c) flexibility of apparatus to meet practical conditions, (d) long and stable life of pyrometer, (e) speedy response to temperature changes, (f) automatic action, (g) accuracy.

How to Get Rid of Scum on a Tank Melting Flint Bottle Glass*

By J. William Gayner

Scum which is commonly known to the layman in glass houses is quite a bothersome affair as it curtails the melting tonnage of the tank and also has a tendency to seed and streak the glass.

I would not undertake explaining what makes scum, as I do not know. I have heard this question discussed by many able glass men and they vary in opinion. One claims it comes from the soda, another from the lime, and another from lowering the temperature of the furnace on Saturday and Sunday blocks. In general practice these few things, which I will enumerate, help to get rid of scum.

OLD LIME.—It is oftentimes the practice to let the fresh lime be dumped in the bin on top of the old lime, consequently the old lime is losing its strength, and then when the lime gets low, they will go back and get this old lime in the back of the bin which has been lying there for a long time. I have made a practice of using the old lime before we start using the new lime.

OLD SODA.—The same thing holds good in regard to soda. Having twin bins or shoveling the old shipment forward, before the new shipment is unloaded on the old, will keep these materials in better condition.

IRREGULAR FURNACE OPERATION.—I think the greatest cause is the irregular running of the furnace, allowing the furnace to get cold Saturday nights and Sunday, and then bringing it up quickly so as to be ready for work on Monday.

I have tried to avoid these conditions, but even so I have scum on the tank. A simple method, which I will try to explain, has been a big help to me for a number of years.

I have a couple of men Sunday morning open the skimming hole just before the bridge in the melting pot. The furnace will be lower in temperature, so they can skim off all the dross, rough matter and scum. By so doing each Sunday morning, we keep rid of the scum. I realize that the bridges in some furnaces are so constructed that it is impossible to have the skimming hole so arranged as to do what I have described, but my practice is always to push the bridge away from the last port so as to have room for the skimming hole.

*Jl. Amer. Ceram. Soc., Vol. 7, No. 3. Presented at the Atlantic City meeting, February, 1924. (Glass division.)

The Glass Industry

The First Technical Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials, and Glass Factory Equipment and Operation.

Published Monthly by the
GLASS INDUSTRY PUBLISHING COMPANY, INC.
50 Church Street, NEW YORK

Telephones { Cortlandt 2465 / Cortlandt 5618 — Cable Address, Glasdustry

J. B. KRAK, Technical Editor

Subscription Price.....$2.00 a Year
Single Copy.....20 Cents

THE GLASS INDUSTRY circulates extensively among American and foreign glass manufacturers, their business executives and technical and factory operating staffs.

ADVERTISING RATES SENT ON REQUEST

Vol. 5 NEW YORK, APRIL, 1924 No. 4

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CLASSIFIED BUYERS' GUIDE, PAGE 18
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Readers of THE GLASS INDUSTRY in the United States and elsewhere are requested to favor the Editor with any information available from time to time concerning developments in their own or other fields which would be of general interest to the industry. Authoritative facts about new glass manufacturing projects, re-organizations, new factory construction, new processes and equipment, raw materials, manufacturing and market conditions, personal items, and other appropriate subjects would be welcomed.

Those experienced in the practical, technical or executive activities of glass manufacturing who are qualified and willing to lend their aid to the upbuilding and progress of the industry by giving from their store of knowledge to others, are invited to submit for publication articles on any subjects relating to glass which would be of interest and value to our readers. The authors of accepted articles of this kind will be compensated at usual rates.

Good Designs Demanded

Bits of evidence accumulated from time to time tending to show that the mass of American buyers of house furnishings and similar goods are displaying better taste and judgment than formerly in making their selections from dealers' stocks, placing more emphasis upon quality and artistic value than on cheapness.

There are many forces constantly at work throughout the country educating the people to a better understanding of the true principles of art, teaching them that mere ornateness does not necessarily make an object artistic and that true beauty is often found in the simplest lines and forms, properly proportioned.

The effect of these teachings is beginning to show in the more critical attitude of the average buyer. The wise manufacturer of glassware will give due consideration to the tendencies of the modern buyer and spare no effort to gain and maintain a reputation for producing designs based on sound artistic principles, as well as for the quality of the glass itself. Along these lines the small manufacturer has an opportunity almost equal to that of the large producer.

Technical Consultation Service

Question 56. **Bending thin wall tubing without buckling.** I would like to know how to bend thin wall glass tubing in U form without buckling.

Answer. Thin wall glass tubing can be bent without buckling by heating it in a 'soft" flame, i. e., a luminous flame of low temperature. The glass should be bent very slowly while at the same time air is blown in the tube which is closed at one end. The air pressure prevents buckling; it should be carefully regulated since too much pressure would cause a hole to be blown in the glass at the place where it is heated to the softening point.

Of course, a great deal of practice is necessary in order to do good work. This applies to any sort of glass blowing. —J. B. K.

Notes From Abroad on Glass

(Abstracts from Foreign Publications)

MANUFACTURE OF OPTICAL GLASS

German Patent No. 360,342 is concerned with a process in which an optical glass of correct quality is made from other glass which has not been made in the correct manner. This glass melt, whose composition is not exactly what is called for in the specifications, is ground up after the batch has cooled off and congealed. Then this powdered glass may be mixed with other powdered glass of still different composition but of such character that the combined mixture of the two glasses will give a product which meets the specifications. The process may be carried out in this manner, or else the proper amounts of the different ingredients of the glass batch in which the first-named glass fell short of the specifications noted in the standard directions may be added and the mixture may now be melted again. The melting process should be carried out in pots that are as flat as possible and are preferably made in the form of a shallow dish.

PLATE GLASS ANNEALING LEHRS

A lehr for annealing plate glass has a muffle chamber in the upper wall in which are horizontal heating flues. Each of these flues is provided with a separate burner and damper with or without a separate combustion chamber. This apparatus is patented in British Patent No. 208,014.

SEALING BETWEEN METAL AND GLASS

British Patent No. 202,941, which is assigned to the Naaml. Vennoots Philips' Gloeilampenfabrieken, of Holland, is concerned

with a device or devices for hermetically sealing a metal to glass, or for hermetically sealing a glass vessel.

A substitute for platinum in hermetically connecting a metal to glass, or for hermetically sealing glass vessels, consists of a ring or cap made of chrome-iron, containing from 10 to 50 per cent of chromium (or from 17 to 20 per cent of chromium when used with X-ray glass), and with a co-efficient of expansion little different from that of the glass. The ring or cap is sealed to the glass at its edge.

Shaping Quartz

A mold is packed with pieces of quartz of such shape that the spaces between the pieces do not substantially exceed 16 per cent of the total volume of the mold. When the quartz is heated until it becomes plastic, which takes place at a temperature of approximately 1,650 degrees, the expansion due to its conversion into another form of silica will cause the mass to fill the mold and so take the desired shape. Any surplus of material is expelled through a vent-hole left for that purpose. For further details see British Patent No. 207,457.

Action of Potassium Carbonate on Glass

Potassium carbonate has a distinct solvent action on lead glass bottles in which it may be stored, particularly when the moisture gains access to the bottle. The salt thus becomes contaminated with considerable quantities of lead and arsenic. A specimen of potassium carbonate containing originally less than five parts per million was found to contain 150 parts of lead after it had been kept for nine weeks in a lead-glass bottle fitted with a defective stopper. For further details see *Analyst*, vol. 48, pages 260-2.

Pitch Used in Working Optical Glass

A very comprehensive discussion of the properties of the pitches that are employed in the working of optical glass is given in the *Trans. Optical Society*, vol. 24, pages 117 to 140. The pitches that are employed for this purpose are of two kinds, the relatively soft wood pitch used in making polishes, and the harder coal tar "backing" pitch which is employed for mounting the lenses in "blocks." Tests commonly employed are: determination of the twisting point; that is, the lowest temperature at which a rope of the pitch can be twisted indefinitely; chemical examination, for example, the determination of the volatile and soluble matters, fixed carbon, ash, etc.; and penetration tests, in which a loaded needle, either pointed or with a blunt end, is forced into the pitch. Details of the tests and the results obtained are described. The mounting of the lenses is also discussed.

Resistant Glass

Resistant glass, which is suitable for the manufacture of chemical apparatus, is manufactured by fusion at approximately 1,400 deg. C. of a mixture of 60 to 70 per cent of sand, 15 to 30 per cent of anhydrous boric acid one to two per cent of sodium carbonate, three to six per cent of potassium carbonate, two to six per cent of kaolin, one to four per cent of mica, one to three zirconia, and one to three per cent of titanic oxide. The glass has the desirable physical properties of quartz glass, but is more easily manufactured and worked. It is not brittle like other hard glasses, it is a good electrical insulator, and is very resistant to chemical action For further particulars see British Patent No. 192,713.

Use of Phonolite in Glass Making

An artificial phonolite which has the following composition:

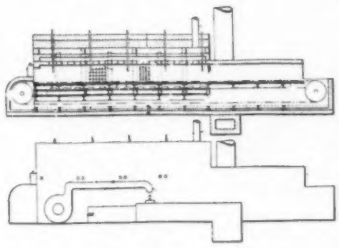
Silica	60.50 per cent
Alumina	20.30 " "
Iron oxide	2.99 " "
Lime	2.45 " "
Magnesia	0.08 " "
Potash	5.06 " "
Soda	6.29 " "
Loss on ignition	2.26 " "

This product is made in Germany, it is claimed, at one-third the price of its equivalent, in sand, alumina, lime and soda. It can be stored indefinitely in the open air without deterioration, contains no combined water, does not create any dust, melts without any difficulty at a temperature of 1,150 deg. C. to a grey green glass, and is an excellent flux. On account of its iron content its use is confined to bottle glass and glasses in which color is unimportant. The glass made from it is very resistant to heat and to chemical action. For further details see *Sprechsaal*, vol. 54, pages 355 to 356.

New Patent Covers Combination of Electricity and Fuel for Heating Lehrs

A United States patent (No. 1,486,265) based on a novel idea for obtaining better control of lehr temperatures, was granted on March 11, 1924, to Robert D. Pike of San Francisco, California.

The inventor states that he has attached thermocouples to a bottle passing through an electrically heated lehr, and has found that the actual temperature of the glass is quite different from the temperatures recorded by the thermocouples inserted through the roof to within a few inches of the glass articles.



Also he has discovered that the cause of this discrepancy is the relative transparency of glass to wave lengths of the visible spectrum concerned in transmitting heat energy by radiation from the electric resistors, which are at a glowing red heat. It is desired that this heat should be efficiently transferred to the glass for heating it up to annealing temperature, but instead of such being the case, this radiant energy passes completely through the almost transparent glass and is transposed into sensible heat on the internal walls of the muffle back of the resistors and on the surface of the thermocouples. These latter, therefore, register temperatures considerably higher than the true temperatures of the glass in the heating region of the lehr; and the excessive temperature of the inside face of the muffle results in high losses by radiation.

The most effective means inside the lehr for transferring the heat energy from the resistors to the glass articles is the stray convection currents caused by the rising of heated air in contact with the heated resistors and inside walls of the muffle and the corresponding fall of cooler air through the glass articles, thus setting up a circulation of air which transfers heat from the resistors to the glass articles by means of convection. It is obvious that this same condition will exist whether the muffle be heated internally by electric resistors or externally by fuel. But these convection currents are stray and accidental and are not employed systematically to help accomplish the heat transfer work of the lehr.

The object of this invention is to provide strong systematically effected vertical convection currents within the lehr which will cause an efficient transfer of heat from the walls or resistors in the heating region to the glass articles, and from the latter to the walls in the cooling region; and these same convection currents sweeping strongly over the glass articles and thermocouples in turn, will cause the latter to register the true temperature of the glass and to control the electric input accordingly. In this way, it is claimed, it is possible to closely control the true temperature of the glass, thus causing perfect annealing and at the same time greatly decreasing the electric input to the resistors by reducing the temperature of the inside of the muffle in the heating portion and by reducing the electrical input in the cooling portion.

In operation of the lehr, the fuel burner in the fire box and the placing of the dampers are so adjusted that the temperature readings on the thermocouples are slightly below the temperatures desired for perfect annealing. The fuel fired and the adjustment of dampers are then kept constant. The small additional amount of temperature necessary is then supplied by electric current admitted to the resistors by the automatic electric control referred to above, but not shown, which also takes care of all the normal variations in operation and automatically maintains a constant reading on the thermocouples with the use of a very small amount of electric current. This quantity of electric current is necessarily very small because the principal heat energy required by the lehr is supplied by the fuel burned in fire box, and only a small amount of it by the electric current, but the quantity of the latter is sufficient to effect the automatic control of the temperature necessary for perfect annealing.

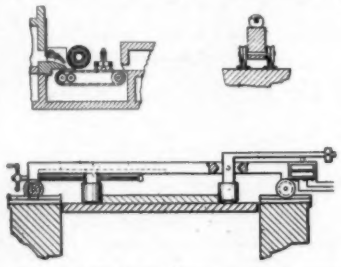
Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Copies of United States Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

Glass Machinery. U. S. 1,482,106. Jan. 29, 1924. Clarence W. Avery and Wenzel G. Vesey, of Detroit, Mich., assignors to Ford Motor Company, of Detroit, Mich.

The object of this invention is to provide a regulator for the width of continuously produced strips of plate glass while being manufactured by the so-called continuous - flow method. The apparatus is adapted to function automatically to keep the resulting strip of uniform cross - section. A width regulator is provided with suitable contact arms which will follow the edges of the strip produced so that variations in width of the strip may move these contact arms to actuate mechanism for correcting any tendency toward irregularities.

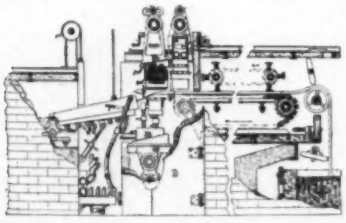


The regulator with means connected to the driving power of the conveyor for varying the speed of the conveyor so that the latter may vary its operating speed relative to the amount of glass supplied thereto, is provided, thereby increasing or diminishing proportionately the width of the strip produced on the conveyor.

Electrical connections between the contact arms mentioned and the electrical driving connections for the conveyor are provided whereby the speed of the driving motors may be increased or decreased as may be necessary.

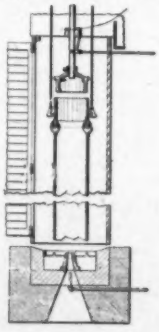
Method and Apparatus for Forming Glass. U. S. 1,483,336. Feb. 12, 1924. Robert M. Corl, of Maumee, O., assignor, by mesne assignments, to Erie Glass Company, of Toledo, O.

The method of forming sheet glass, which consists in continuously drawing from a molten source of supply a sheet mass of glass which is of greater thickness than the finished sheet to render it easy to control and to reduce its sensitiveness to temperature changes and after the mass has become substantially set in form applying a converting heat to the forward end portion thereof continuous with the drawing to flow therefrom a finished sheet of less thickness than the mass, supporting the finished sheet at a distance from the converting mass end to prevent marring, and conveying the sheet away.



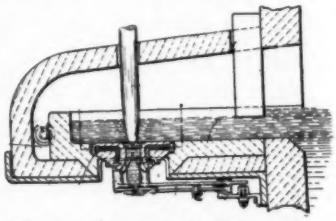
Manufacture of Glass Cylinders. U. S. 1,484,339. Feb. 19, 1924. Clyde S. Robb, of Charleroi, Pa., assignor of one-half to Charles J. Kunzler of Pittsburgh, Pa

The inventor claims in apparatus for drawing glass cylinders, a stationary conduit having a passage leading to the bottom portion of the article being drawn, an air supply pipe arranged to discharge thereinto, said conduit and its opening being in injector relation to the discharge end of the air supply pipe and of less area than the cross sectional area of the article being drawn, and the cross sectional area of the air supply pipe at its discharge end being less than the cross sectional area of said passage, substantially as described.



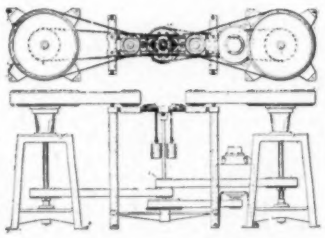
Producing Formed Charges of Molten Glass. U. S. 1,484,085. Feb. 19, 1924. John F. Rule, of Toledo, O., assignor to the Owens Bottle Company, of Toledo, O.

Among the inventor's claims is a combination of a receptacle to contain molten glass, means for causing a regulated flow of glass from the receptacle comprising a pair of segments mounted to rock about horizontal axes and having abutting faces in rolling contact, said faces provided with vertically disposed recesses which together form a channel through which the glass issues, automatic means for periodically rocking said segments up and down, and means to periodically sever the glass beneath said segments, said recesses being upwardly and outwardly flared whereby the diameter of the channel is increased by the downward movement of the segments and decreased by their upward movement.



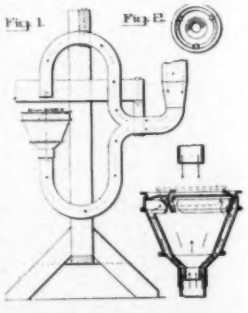
Smoothing Machine for Glassware. U. S. 1,483,884. Feb. 19, 1924. Forrest L. Hitchcock, of Indianapolis, Ind., assignor to the Marietta Manufacturing Company of Indianapolis, Ind.

The inventor claims a smoothing machine comprising frame members, a pair of abutting wheels rotatably supported in horizontal position on said frame members, a pair of tension pulleys adjustably mounted on said frame members intermediate said abutting wheels, smoothing bands passing about said abutting wheels and their adjacent tension pulleys, means for maintaining said pulleys in position to maintain a tension on said bands, a vertically positioned shaft connected with each of said wheels, and means for driving said shafts whereby said wheels will be directly driven thereby.



Heat Treatment of Glass Articles. U. S. 1,483,461. Feb. 12, 1924. Jesse T. Littleton, Jr., of Corning, N. Y., assignor to Corning Glass Works of Corning, N. Y.

The inventor claims the method of heat treatment of pressed glass articles to increase their thermal and mechanical endurance which consists in heating the article after pressing to equalize the temperature of different parts thereof, and in then rapidly uniformly cooling the article from a substantially uniform temperature above the annealing temperature of the glass of which it is composed by high velocity air jets directed on substantially the entire surface of the article.



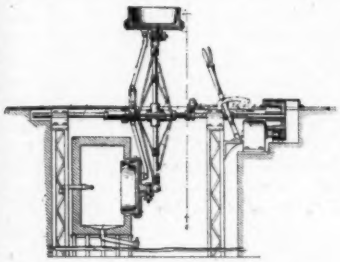
The result obtained is a greater cooling of the surfaces of the glass than the intermediate layer thereof, whereby the surface layers are placed under compression by the subsequent cooling of the intermediate layer. If an article so treated is subsequently heated to below its annealing temperature and then cooled, the initial effect of the cooling (which, if the article was annealed, would be to put tensile strength on the surface layers) is merely to reduce the compression strains in such surface layers, which however

return to approximately their original values on the uniform cooling of the article.

Thus, the setting up in use, of tensile strains from cooling is prevented.

Glass-Drawing Device. U. S. 1,484,101. Feb. 19, 1924. William Westbury, of Caney, Kans.

This invention relates particularly to pot and kiln constructions for use in the drawing of glass cylinders.

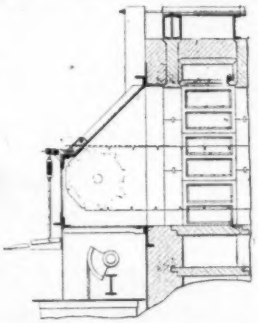


One object is to provide a novel construction and arrangement of heating kiln and reversible pots, which latter are alternately and successively movable between a drawing position above the kiln and the kiln itself, for drawing and aftermath melting and draining operations.

Another object is to provide a rotary support for the pots whereby the pots may be alternately and successively moved to a drawing position above a work floor or platform and to a draining position within a heating kiln below the floor or platform, the kiln being vertically arranged and the pots also movable as revolved between horizontal drawing and vertical draining positions.

Charging Door for Lehrs. U. S. 1,484,521. Feb. 19, 1924. Edwin E. Milner of Scott Township, Pa., assignor to H. L. Dixon Company of Carnegie, Pa.

The charging opening of the lehr is provided with a door formed in as many sections as may be necessary or desirable, depending upon the width of the lehr. Preferably each of these sections is relatively narrow so that when opened it will admit a limited quantity of outside air to the interior of the furnace. Each of the door sections consists of a plate of sheet metal, which is pivoted, with a counterweighted portion below its pivot. The counterweight is so proportioned that the doors will normally be held in the inclined closed position shown in the drawing, but may be very easily depressed into an open position.



In charging the lehr with many classes of glassware, the doors can be opened by simply pressing the charging forks against the doors as the glassware is inserted into the furnace. As soon as the charging fork is withdrawn, the counterweight will return the door section to its closed position. In charging lighter ware, however, it is desirable to provide means whereby the door may be independently opened to admit the ware. For this purpose there is provided a foot treadle connected by a link with a lever having a pin and slot connection with the counterweighted end of the door section. One of these treadles and these connections are provided for each door section.

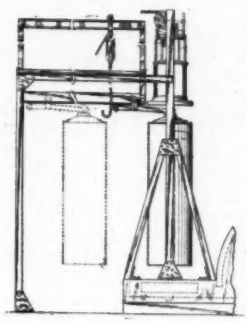
Glass Mosaic. U. S. 1,485,753. March 4, 1924. Emil Zundel, of New York, N. Y.

In order to overcome the tendency of thin glass mosaics to separate from the cementitious base against which they are placed, the inventor has provided a composition which, he claims, can be very easily prepared and applied to the rear surface of the mosaic and burned therein at the same time that the front surface colors are burned in. This composition when so burned forms a rough back face on the mosaic which causes it more intimately to unite with the cementitious foundation and prevent the liability for the mosaic to drop out of place.

As a preferred form of composition the inventor uses ingredients in the following proportions: One pound each of sand, glass and flux and one ounce of whiting. These ingredients are mixed to form a powder; the glass being either powdered glass or crystal glass, which can be broken up. The composition is in the form of a dry powder which can be stored in containers. When it is desired to treat the mosaic, the back surface is treated with varnish, shellac or other binder material and the powder dusted thereon. It is then put in the furnace and the coating burned in at the same time the usual colors on the front surface are burned in.

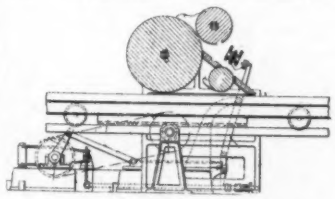
Method of and Means for Making Sheet Glass. U. S. 1,485,928. March 4, 1924. George W. Holsinger, of Vincennes, Ind.

The inventor claims the method of making sheet glass consisting in drawing a flattened tube from a mass of molten glass through a hollow device having two straight opposite sides and floating in the mass of glass, in carrying the tube through the atmosphere, in transferring the tube flatwise to a holder to support the lower portion of the tube, in placing a flat supporting table horizontally in the tube, in cutting off the uppermost flat side of the tube, in removing the cut-off portion upon the table, and in cutting off the lower-most flat portion of the tube from the remaining portions thereof on the holder.



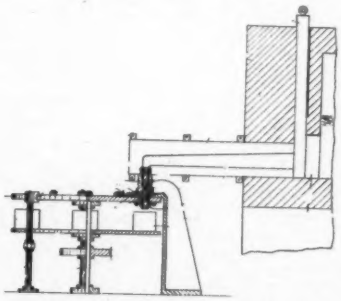
Machinery for Producing Glass Sheets or Plates. U. S. 1,485,500. March 4, 1924. Alfred L. Forster, of Smethwick, England, assignor of one-half to Chance Brothers & Company, Ltd., of Smethwick, England.

The invention comprises the employment for cutting glass sheets transversely, of rotary cutting tools, and a holder for the tools to which a movement is imparted in the same direction as the glass during the cutting operation. Also the imparting to the carrier or table which receives the severed sheets or plates, of intermittent accelerated movements whereby the sheets or plates are separated after the cutting operations.



Automatic Flow for Glass Tanks. U. S. 1,484,952. Feb. 26, 1924. William H. McSwain, of Moundsville, W. Va., and Harry W. McSwain, of Detroit, Mich.

The inventor claims an automatic flow for glass, comprising, in combination with a glass tank, a spout leading from the tank, a horizontal stand located beneath said spout and having a vertical passage therethrough, means for conducting glass from said spout to said passage, a rotating table having the edge portion thereof in closely underlying relation to said stand and having oblong openings in said edge portion, said openings being located to be successively carried by rotation of the table into register with said passage for receiving glass from the latter, a shear, means for actuating said shear across the lower end of said passage at a definite point in the registration of each table-opening with said passage, a second table located beneath the first table and molds carried by the second table in position to receive charges of glass detached by said shear.



The Glass World and What It Is Doing

News of the Industry

Pittsburgh Plate Glass Company Annual Report

The annual report of W. L. Clause, chairman of the board of directors, and Charles W. Brown, president, of the Pittsburgh Plate Glass Company for the year 1923 showed net earnings of $19,113,123, after the usual deductions for depreciation and obsolescence and estimated Federal taxes on income. The surplus account, which on January 1, 1923, amounted to $24,704,041 was reduced to $13,552,991 on January 31, 1923, by the payment of a 30 per cent stock dividend amounting to $11,151,150. The balance of current earnings for the year, after paying cash dividends of $8,161,392 in 1923, and setting aside in reserve $4,369,878 on account of dividends to be paid in 1924, was sufficient to increase the surplus account to $20,152,573.

STATEMENT OF ASSETS AND LIABILITIES, DECEMBER 31, 1923

ASSETS

Investment		$36,773,287.61
Merchandise		$8,793,235.88
Material and working accounts		7,528,962.90
Bills and accounts receivable		15,446,016.65
Federal Government and other securities		11,636,452.20
Cash		2,808,794.90
Quick assets		$46,213,462.53
		$82,986,750.14

LIABILITIES

Capital stock authorized		$50,000,000.00
Less unissued capital stock		1,445,800.00
		$48,554,200.00
Sundry Credits:		
Bills payable		.....
Accounts payable current		2,524,617.06
Insurance Fund		364,857.17
Reserve for inventory deflation, obsolescence and other contingencies		3,801,076.33
Reserve for estimated Federal income taxes payable in 1924		2,750,000.00
Reserve for employees stock contracts		469,548.37
Reserve for dividends declared in 1923—Payable in 1924		4,369,878.00

PROFIT AND LOSS

Surplus January 1, 1923		$24,704,041.42
Unused Portion 1922 Reserve, Federal income taxes		17,525.62
Earnings 1923—Less depreciation, obsolescence and reserve for estimated Federal income taxes payable in 1924		19,113,123.67
		$43,834,690.71
Less—		
Cash dividends 1923	$8,161,189.50	
Stock dividends 1923	11,151,050.00	
Cash dividends declared in 1923, payable in 1924	4,369,878.00	
		23,682,117.50
Balance in Surplus Account Dec. 31, 1923		20,152,573.21
		$82,986,750.14

The report stated that the physical assets of the company are carried on the books at very conservative values. The productive capacity of the plate glass plants if replaced at present values would cost considerably more than double the amount of their book value. Investments of over five million dollars in real esate other than factory sites has a much greater present value. There is no book value for good will, and patents which protect many of the company's operations, and some of which yield royalties, are carried at nominal values.

The demand for plate glass was extraordinary, due largely to the increase in automobile production, especially closed bodies, and the activity in building construction. Sales in this country for 1923 were about 115,000,000 feet, of which 89,000,000 feet were manufactured in this country, and 26,000,000 feet imported, principally from Belgium and France. The Company's own plant in Belgium, which was destroyed during the war, and of which the reconstruction was completed in 1922, was operated throughout 1923, and in order to relieve the exceptional demand, supplied a portion of the imports into this country. Now that the world supply has caught up to the demand, the Courcelles company will re-establish its business in European, South American and other countries, which was interrupted by the war. In every way this new plant has fulfilled expectations. New plants, and improvements and extensions to existing plants, which will add 35,000,000 feet to the annual production of plate glass in this country, are under construction by the company and other manufacturers, and plans have been adopted providing for a further increase in domestic productive capacity of at least 15,000,000 feet per annum.

In window and art glass, the bevelling and silvering of glass, in chemical, paints, varnish, linseed oil, brushes, refractories, and the warehouses, there were increases in volume of the company's business and the net returns were satisfactory.

The success of the consolidation of 1920, when the chemical, paint, varnish and brush companies were absorbed, and the resulting diversification of the business, with its stabilizing effects is again recorded. The company's sales of plate glass are less than half of the total sales.

The melting and annealing section of the new process plate glass plant at Creighton is completed and in operation. The rest of the unit will be completed early in the year. The completion of the remainder of this plant will be proceeded with as quickly as practicable, consistent with the best results.

The Mixed Claims Commission has made an award of $990,000, with interest at five per cent per annum from January 1, 1920, in favor of the Company against Germany for war damages to their Belgian plant. The amount has not yet been paid, but under the Treaty of Berlin the property of enemy aliens sequestrated during the war will be held as security until Germany has provided for the payment of the awards of said Commission. The prospects for the year 1924 in all lines were reported as favorable.

Libbey Glass Company Wins Suit

Judge Westenhaver, Federal Judge for the Northern District of Ohio, sitting at Toledo, has decided the suit of the Owens Bottle Company against the Libbey Glass Company in favor of the defendant.

It is well known in the trade that before the Owens Bottle Company was formed, Mr. Owens was superintendent in the plant of the Libbey Glass Company, and Mr. Libbey was its president. When the Toledo Glass Company was formed to take over and exploit the Owens patents, contracts were made between the Libbey Glass Company and Toledo Glass Company for an exchange of patent rights, including any improvement patents, the Toledo Glass Company was to have rights under all Libbey patents so far as the same were usable in the manufacture of bottles and jars of all kinds, and the Libbey Glass Company was to have rights under all Owens and Toledo Glass patents so far as the same related to the manufacture of electrical glassware, bulbs, tubing and other articles. The Owens Bottle Company grew out of and succeeded to the rights of the Toledo Glass Company. Commencing in 1914, the Libbey Glass Company developed the so-called Danner patents for drawing glass tubing, and in 1916 granted a license to Kimble Glass Company, Vineland, N. J., to use these patents in the manufacture of lime glass tubing, for the manufacture of homeopathic vials, and for other purposes.

In 1921 the Owens Bottle Company made a claim of right under the Danner patents, claiming that inasmuch as a vial was a bottle, it had the right to use the patents to the extent that they were usable in the manufacture of vials or bottles. A suit was brought on this claim and on the claim that by granting a license to the Kimble Glass Company the Libbey

Glass Company had infringed the rights of the Owens Company under these patents.

Judge Westenhaver's decision was to the effect that by the terms of the contracts between the two companies, the Libbey Glass Company was not obliged to grant rights to the Owens Bottle Company under any patents which related to the manufacture of tubing, and further that "practical construction" given to the contracts between the two companies by Mr. Owens, Mr. Walbridge, and other officers of the Owens Bottle Company, on the one part, and officers of the Libbey Glass Company, on the other part, made it apparent that the practical men in charge of the affairs of these companies regarded the Danner patents as exclusive property of the Libbey Glass Company, and did not consider that the Owens Company had any interest or right in them. In view of the language of the contracts and the practical construction of the contracts, Judge Westenhaver did not find it necessary to decide whether a vial was the equivalent of a bottle, nor did he decide other questions raised in the case.

Owens Bottle Profits Up

The Owens Bottle Company for 1923 reports manufacturing profit of $3,074,295, against $2,907,370 in 1922, and net profit after all deductions of $3,560,563, against $2,554,862 in the previous year. After allowing for dividends on the preferred stock the balance was equal to $4.47 a share on the $16,512,750 common stock, against $4.41 in 1922.

The detailed statement of earnings for 1923 and 1922 follows:

	1923	1922
Manufacturing profit	$3,074,295	$2,907,370
Royalties	1,990,443	1,736,661
Total profit	$5,064,738	$4,644,031
Other income	1,037,236	1,576,609
Total income	$6,101,974	$6,220,640
Expenses, etc.	2,161,411	1,898,918
Federal taxes	380,000	675,800
Net profit	$3,560,563	$3,554,862

Increasing Lime Production Facilities

The Ohio Hydrate and Supply Company, Woodville, O., are improving their quarry equipment by installing a 60 x 84 inch Traylor jaw crusher for producing kiln stone. Their plant for glassmakers' ground lime built several years ago at the suggestion of a number of leading glass manufacturers who had investigated their product, has a capacity of about 200 tons per working day. The capacity of the kilns is about 450 tons a day and of the hydrating plant about 450 tons per day. The analysis of their glassmakers' ground burnt lime as stated by F. Witmer, general sales manager for the company, is as follows:

Silica	.24	per cent.	Through	10 mesh	100	per cent.
Alumina	.25	" "	"	30 "	84.97	" "
Iron oxide	.03 to .06	" "	"	60 "	70.94	" "
Magnesium oxide	40.30	" "	"	100 "	69.18	" "
Calcium oxide	58.06	" "	"	150 "	60.92	" "
Loss on ignition	1.00	" "	"	200 "	24.36	" "

New Automatic Tumbler Machine

An article in the Toledo O., *Blade* states that the Libbey Glass Manufacturing Company of that city has developed a new machine for the automatic manufacture of tumblers, goblets and similar goods. It is stated that a single unit of the new invention has a capacity of 45,000 tumblers every 24 hours, and that enough units are now in operation to give the Libbey company a weekly production of 1,200,000 tumblers. The process is continuous and only eleven minutes elapse from the time the glass leaves the furnace until the tumbler is completed and delivered to the packing room ready for the carton.

Bulb Manufacturers Sued by Government

The methods used for distributing and selling electric light bulbs throughout the country have been challenged by the Government and a bill in equity has been filed in the United States District Court for the Northern District of Ohio, alleging violation of the Sherman anti-trust law by the General Electric Company and all its bulb-making subsidiaries, and the Westinghouse Electric and Manufacturing Company, and its subsidiary, the Westinghouse Lamp Company. The latter companies are named as co-defendants.

Window Glass Manufacturers Guarantee Prices

The American Window Glass Company on March 15 announced from their headquarters at Pittsburgh that in order to restore confidence in the minds of jobbers and stimulate buying, on all A and B quality single and double strength window glass shipped by them during the period from March 15, 1924, to June 1, 1924, into zones B, C, D, E and F, as defined by their zoning circular of January 25, 1921, they would guarantee the purchaser that in case the Company should make lower prices during that period on any shipments of the same kind of glass into the zones specified they would refund to or credit the purchaser with the difference between the present prices and the lowest prices made by them on later shipments into the same territory.

On March 25, the Libbey-Owens Sheet Glass Company announced a similar guarantee to their customers.

Industrial Publications

Diamond Alkali Handbook, published by the Diamond Alkali Company, Pittsburgh, Pa. A 48-page booklet relating to the company's products, soda ash, caustic soda, and other alkalis, and its technical and commercial services to its customers. Valuable information is given on the determination of the alkalinity of soda ash and caustic soda, the uses of these products in various industries, and analysis of alkalies. Numerous data of value to users of alkalies are given in tabulated form.

Ganisand. A booklet issued by the Quigley Furnace Specialties Company, Inc., 26 Cortlandt street, New York, describing Ganisand, a material used for lining and repairing annealing furnaces and gas generators, for making rammed-in linings, monolithic boiler baffles, special shapes of tile, etc., and for general patching and repairing purposes. The booklet tells how to prepare and use Ganisand and where it can be obtained from distributors' warehouses.

Verified News of Trade Activities

The Pulaski Mirror Company, Pulaski, Va., is erecting a plant on Madison street, 80 by 175 feet.

The Star Glass Company, Star City, W. Va., has increased its capital stock from $40,000 to $100,000.

The Lafayette Window Glass Company, Clarksburg, W. Va., has increased its capital from $150,000 to $250,000.

The Oak Harbor Glass Company, Oak Harbor, O., has been organized with a capital of $25,000 by John H. Fisher, George A. True and others.

The A. T. McClure Glass Company, Reynoldsville, Pa., dealers and jobbers in flat and sheet glass, paints, etc., was recently incorporated.

Clifford K. Baldwin has been appointed trustee of the **International Glass Company,** Millville, N. J., which recently failed with liabilities of $322,934.38 and assets of $109,134.29.

The Bremen Cut Glass Company, a new concern backed by I. G. Collins and Thomas J. Fulton of the Hocking Glass Company, is to be established at Bremen, near Lancaster, O.

The Glass Casket Corporation's plant at Altoona, Pa., was recently sold for $35,000 at a foreclosure sale to Oliver H. Hewit, Worth Kirkpatrick, and F. B. Hess, trustees for the bondholders.

The Owens Staple Tied Brush Company has been organized by the Owens Bottle Company and the Toledo Automatic Brush Company, to manufacture brushes as well as automatic machinery for their manufacture.

The Nurre Mirror Plate Company, Bloomington, Ind., has,

it is reported, cancelled the $150,000 contract for the new addition to its plant because of the city's delay in awarding the contract for a new water system.

The Merit Cut Glass Company, Charleston, W. Va., has been incorporated with an authorized capital stock of $5,000. The incorporators are: D. P. Merritt, C. P. Miller, S. P. Hopper, F. T. White and John V. Ray.

President E. D. Libbey of the **United States Sheet and Window Glass Company,** Toledo, O., announced on March 10 that a dividend of $2.00 on each share of outstanding preferred stock of the company would be paid on April 1, 1924.

The Chattanooga Bottle & Glass Manufacturing Company, Chattanooga, Tenn., are increasing their production capacity by the addition to their plant of automatic feeding devices, installed by the Hartford-Empire Company, Hartford, Conn.

Accident prevention work at the plant of the **Allegheny Plate Glass Company,** according to *Ford News*, has brought a decrease in the number of mishaps since the **Ford Motor Company** assumed control. The January record shows carelessness on the decrease.

The plant of **Baker Brothers,** manufacturers of window glass, at Okmulgee, Okla., made a successful start early in March after being closed for several months. The installation of four cylinder glass drawing machines at this plant marks the end of 38 consecutive years of hand operation.

The W. T. Edwards Manufacturing Company, New Britain, Conn., has been incorporated with a capital stock of $100,000, to manufacture glass and metal products. The incorporators are: Thomas F. Flannery and Teresa C. Flannery of New Britain, and S. Victor Prince, of New London, Conn.

T. R. Harrison has assumed charge of the research department of the **Brown Instrument Company,** Philadelphia, Pa. Mr. Harrison was formerly associated with the pyrometry department of the Bureau of Standards, and more recently with the Champion Porcelain Company, Detroit, Mich.

The Central Glass Company, manufacturers of mirrors, plate and window glass, jobbers, etc., with plants at Louisville, Ky., Huntington, W. Va.; Chattanooga, Tenn., and Evansville, Ind., is planning the construction of a branch plant at Bristol, Va., which will be operated under the name of the **Central Glass Company of Virginia.**

A. L. Metzner was chosen treasurer of the **Hazel-Atlas Glass Company,** Wheeling, W. Va., at a reorganization meeting of the directors. At the same meeting all board members were retained and W. H. McClure and J. H. McNash were added as vice-presidents. George H. Hannan has been made a member of the executive committee.

At the annual meeting of the stockholders of the **United States Glass Company,** held March 19, the old board was unanimously re-elected to serve for the ensuing year, as follows: L. Z. Birmingham, Marion G. Bryce, Reuben Haley, James F. Challinor, L. A. Meyran, H. N. Trimble, C. E. Willock, Ernest Nickel and David Yost.

At a recent meeting of the stockholders of the **Charleston Window Glass Company,** Charleston, W. Va., resolutions were adopted to discontinue business. A deed has been filed in the county clerk's office transferring the property of the company in West Charleston, to the American Window Glass Company, in satisfaction of indebtedness.

For the first time in five years, according to press reports, the four glass manufacturing plants of Okmulgee, Okla., will soon be in full operation. They include the following: **Baker Bros., Interstate Window Glass Company** and **Southwestern Sheet Glass Company,** all manufacturers of window glass and the **Graham Glass Company,** manufacturers of bottles.

The Vacuum Glass Products Company, which was recently incorporated and which has taken over the plant of the Sun Glass Company at Nilan Station, near Point Marion, Pa., is now working at capacity with two shifts of eight hours each. Additional machinery has been purchased which will materially increase production capacity. Dr. F. B. Hess, of Uniontown, is president of the new company.

The **Citizens Glass Company,** Barnesville, Ohio, has been incorporated with a capital stock of $100,000 by E. C. Stewart, O. M. Smith, C. E. Bradfield, George B. Matthews. Jules L. Biron, who is general manager of the new company, states that outside of necessary repairs they are not making any special improvements to the plant at present but during the summer expect to make the plant modern in every way.

The campaign carried on by the citizens of Massillon, O., to raise capital by the sale of stock in the **Ohio Glass Products Company** for the purpose of taking over and operating the former plant of the Rhodes Bottle and Glass Company was successful and the organization of the corporation is proceeding. The incorporators have appointed D. W. Case, managing secretary of the Massillon Chamber of Commerce, as custodian of funds to be held by him until a treasurer is elected.

At the recent annual meeting of stockholders of the **Southwestern Sheet Glass Company,** Okmulgee, Okla., all of the old directors of the company were re-elected and in addition C. C. Waldo was elected. Officers for the ensuing year were elected as follows: H. O. Hemmick, president; W. B. Pine, vice-president; C. Howard Baker, vice-president; M. F. Grahan, treasurer, and Helen Armour, secretary. Enlargements and improvements were authorized by the board of directors, approximating $60,000.

At the annual meeting of the **National Association of Manufacturers of Pressed and Blown Glassware** held at Pittsburgh, Pa., on March 11, the officers and members of the executive committee were re-elected as follows: E. J. Barry, Toledo, O., president; C. B. Roe, Moundsville, W. Va., vice-president; and J. D. Wilson, Tarentum, Pa., treasurer. Exexutive committee: C. B. Roe, Moundsville, W. Va.; Marshall W. Gleason, Brooklyn, N. Y.; C. M. Rodefer, Bellaire, O.; Thomas W. McCreary, Monaca, Pa., and Reuben Haley, Pittsburgh, Pa. It was decided at this meeting that the summer stop for this year will be the same as that of last year.

At the annual election of national officers of the **United Brotherhood of Window Glass Workers** held at Clarksburg, W. Va., recently the following were re-elected for the ensuing year: Morris Hill, Clarksburg, W. Va., president; Robert M. Davis, Salem, W. Va., vice-president, and L. C. Ernst, Clarksburg, W. Va., secretary-treasurer. Al. Mannon, Pendleton, Ind., and Bruce Reed, Clarksburg, W. Va., were re-elected members of the executive board. W. F. Miller, Fort Smith, Ark.; Charles Nordling, Columbus, O., and William Gammill, Clarksburg, were re-elected members of the wage committee. Mark Smith, Danville, Ill., was the fourth member elected to the wage committee.

The most serious fire that has occurred recently in a glass factory destroyed the plant of the **Hocking Glass Company,** West Lancaster, O., on March 7, with a loss estimated by the owners as between $750,000 and $1,000,000. The 657 employees of the company were thrown out of work. It is reported that the company carried $600,000 fire insurance and $525,000 use and occupancy insurance. The lack of adequate fire-fighting facilities is claimed to have contributed to the spread of the fire and the consequent heavy loss and it was reported that the question of rebuilding the plant would not be decided until the company obtained definite guarantees from the city providing proper protection. Meantime customers' orders are being filled from the **Lancaster Glass Company** which the Hocking Glass Company controls.

While no official announcement regarding rebuilding has been made reports are in circulation to the effect that a contract for erecting a new building has been placed.

The Quezal Glass Manufacturing Company, Inc., which recently took over the business of the Quezal Art Glass and Decorating Company, and which is continuing the Quezal line of fine art glassware comprising vases, bowls, tableware, cane, towel bar, tubing and a comprehensive line of electrical shades, torchiers and lamp mountings, has been incorporated under the laws of the State of New York with an authorized capital of $50,000. The officers of the new concern are: John A. Ferguson, president; Louis Kuntz, treasurer; Edw. J. Conlan, secretary; Martin Bach, Jr., general manager.

At the present time the company is running one furnace of eight pots and is making various improvements on a large scale with a view to maximum output and higher efficiency. The company is preparing to start another furnace in operation within six weeks which will increase the capacity by nine pots. The company has discontinued its sales connection with

the firm of Woodward & Edmunds of 286 Fifth avenue, and are directing the sales force from the factory. The metropolitan and adjacent territory at the present time is being covered by W. A. Edmunds who is well and favorably known throughout the trade—the territory east of Chicago being covered by J. Joel. The company has also made sales connections with sample rooms in Milwaukee, Minneapolis and Chicago. Inquiries received to date justify the belief that within a very short period the plant will be running to capacity and all indications point to the fact that the company has started on its career very auspiciously.

The company has designed an entirely new line of shapes and decorative effects which they are now cataloguing and will exhibit to the trade within a very short time.

Personal

Donald Robertson, B. Sc. Tech. Dip. Glass Tech., for the past year works chemist for John Lumb & Company, Ltd., manufacturers of glass bottles, Castleford, England, has accepted the post of technical director of the Société Francaise des Verreries d'Indo-Chine, Etablissements de Cong-My, Haiphong, Tonkin, Indo-China, whose administration offices are located in Paris. The new company will manufacture glass kerosene lamps, bottles, jam jars, tumblers, and may consider later the installation of machinery for window glass manufacture. Mr. Robertson will sail from Marseilles for Haiphong on April 10th.

Inquiries Received

For further information address THE GLASS INDUSTRY

182. We would like the names of manufacturers of bent glass for show cases, etc. (Mar. 12.)

183. We are interested in obtaining up-to-date equipment for the cutting of circles from glass balls and sheets. We are desirous of obtaining devices or equipment which will enable us to obtain volume production at minimum labor cost. (Mar. 11.)

184. Will you kindly give us the names of concerns east of the Mississippi who could produce glass in the form of marbles or especially molded tablets or who make machines for this purpose? (Mar. 15.)

185. Can you give me the names of concerns making air tight glass specimen jars, 6 by 4 (or 6) by 18 inches, the 18 inches being either horizontal or perpendicular measurement? (Mar. 17.)

186. Can you give us the names of manufacturers of iridescent glassware? We refer to the cheap line sold in the ten and twenty-five cent stores and which is known as "doped" glass. We are interested especially in securing a small crimped amber berry dish, 4½ in. in diameter. (Mar. 18.)

187. (From Indo-China.) We would be interested in receiving catalogs from manufacturers of machinery for making glass kerosene lamps. (Mar. 8.) Address them to Donald Robertson, Technical Director, Société Francaise des Verreries d'Indo-Chine, Etablissements de Cong-My, Haiphong, Tonkin, Indo-China.

188. We would like to obtain detailed information on the production of glass tumblers and goblets. (Feb. 25.)

189. We desire to obtain a machine or drills for drilling holes in glass, of all thicknesses from single strength to plate glass, and of all dimensions up to one-half inch. (Mar. 4.)

190. One of our customers located in Singapore desires to obtain garden gazing globes. Can you give us the names of two or three manufacturers of such articles? (Mar. 25.)

191. I am investigating the feasibility of erecting a glass plant in or near Denver and would like to obtain catalogs or information regarding equipment. (Mar. 22.)

192. Please send names of distributors and jobbers in New York and vicinity handling thin blown tumblers, stemware, electric and gas shades and globes.

Coming Meetings

The annual meeting of the **American Chemical Society** will be held at Washington, D. C., April 21 to 25.

The Spring meeting of the **American Society of Mechanical Engineers** will be held at Cleveland, O., May 25 to 29.

The next meeting of the **American Society for Testing Materials** will be held at Atlantic City, N. J., June 23 to 28.

Society of Glass Technology, S. English, secretary, announces meetings as follows: April 16, Sheffield (annual general meeting); May 21, London and June 18, Sheffield.

The **Glass Container Association of America** and the **National Bottle Manufacturers' Association** will hold their annual meetings at Atlantic City, N. J., the last week in April.

The annual meeting of the **National Glass Distributors' Association** will be held in Pittsburgh, Pa., during December, 1924.

A Chemical Equipment Exposition will be held in the State Armory, Providence, R. I., June 22 to 27, 1925, under the management of the **Chemical Equipment Association** and in conjunction with a regular four-day meeting of the **American Institute of Chemical Engineers.**

The next **National Foreign Trade Convention** will be held at Boston, Mass., June 4, 5 and 6.

The Summer Meeting of the **American Ceramic Society** will take the form of a four weeks' trip to the Pacific Coast, leaving Chicago on July 21 and returning on August 16. Stops will be made at Spokane, Seattle, Lincoln, Cal., San Francisco, Los Angeles. A visit will be made to the Yosemite Valley and the return trip will offer an opportunity to visit the Grand Canyon.

Stock Quotations

(Reported by Moore, Leonard & Lynch, Frick Building, Pittsburgh, Penna.)

PITTSBURGH STOCK EXCHANGE, MARCH 24, 1924.

	Bid	Ask	Last
American Window Glass Machine, common	91	92½	91½
American Window Glass Machine, preferred	94	..	96
American Window Glass, preferred	108¼	109	108¾
Pittsburgh Plate Glass	250	255	254½
U. S. Glass	..	24	24¼
Standard Plate Glass, common	..	33½	33
Standard Plate Glass, preferred	..	89½	91

Glass stocks have been active and strong the past month on the Pittsburgh Stock Exchange, with unusually heavy trading in the Standard Plate and Pittsburgh Plate Glass issues.

Standard Plate Glass sold from 28 to 39 on the announcement that at the next interest period, September 1st, the company would retire all its bonds, replacing them with common and preference preferred stock.

A substantial earning report for 1923 strengthened the surplus account of Pittsburgh Plate Glass materially. The surplus statement was largely responsible for the strength in this issue.

WHEELING STOCK EXCHANGE, MARCH 24, 1924

	Bid	Ask	Last
Hazel Atlas	..	33½	34
Imperial Glass	..	90	90
Fostoria	140	150	150
Central Glass	105	115	110

The Wheeling issues were quiet during the last month, holding about the same price levels, although the past two weeks quite an active market developed for Hazel Atlas at 33½ to 34½ on anticipated dividend action at the directors' meeting March 24th.

TOLEDO STOCK EXCHANGE, MARCH 24, 1924

	Bid	Ask	Last
Owens Bottle Machine, common	43	43¼	43½
Libbey-Owens Sheet Glass, common	95	98	..
Libbey-Owens Sheet Glass, preferred	107	110	..

Current Prices of Glass-Making Materials

Quotations furnished by various producers, manufacturers and dealers

March 24, 1924

		Carlots	Less Carlots
Aluminum hydrate ($Al(OH)_3$)	lb.	.05	.05½
Aluminum oxide (Al_2O_3)	lb.	.06½	.07
Antimony oxide (Sb_2O_3)	lb.	.07½	.08½
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.12	.13
Barium carbonate ($BaCO_3$) (precipitated)	ton	70.00	85.00
Barium hydrate ($Ba(OH)_2$)	lb.	.05	.05½
Bone ash	lb.	.06	.06½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.05¾	.06
Borax, fused ($Na_2B_4O_7$) any mesh	lb.	.19	.20
Boric acid (B_2O_3), fused	lb.	.35	.35
Cadmium Sulphide (CdS)—			
Red	lb.	..	1.60
Orange	lb.	..	1.65
Yellow	lb.	..	1.85
Chrome Oxide (Cr_2O_3)	lb.	.30-.34	.36
Cobalt Oxide (Co_3O_4)—			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide—			
Red (Cu_2O)	lb.	..	.20
Black (CuO)	lb.	..	.25
Black prepared	lb.	..	.30
Cryolite (Na_3AlF_6)	lb.	..	.09½
Feldspar—			
100 mesh	ton	14.00-18.00	20.00
80 mesh	ton	15.00	18.00
40 mesh	ton	12.50	15.50
Ferrous oxide (FeO)	lb.	..	..
Fluorspar (CaF_2)—			
Powdered white, 95%	ton	40.00	50.00
Powdered white, 90%	ton	38.00	45.00
Hydrofluoric acid (HF) 60% (in lead carboys)	lb.	..	.13
Kaolin (f.o.b. mine)	ton	9.00	14.00
Lead Oxide (Pb_3O_4) (red lead)	lb.	.12	.12¼
Litharge (PbO)	lb.	.11½	.11¾
Lime—			
Hydrated ($Ca(OH)_2$) (in 50 lb. paper sacks)	ton	12.50	..
Burnt (CaO) ground, in bulk	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground, in 280 lb. bbls. per bbl.		2.15	2.30
Magnesium carbonate ($MgCO_3$)	lb.	..	.09
Manganese 85% (MnO_2)	lb.	.03½	.03¾
Nickel oxide (Ni_2O_3), black, for nickel content	lb.	.32	.45
Nickel monoxide (NiO), green, for nickel content	lb.	.30	.50
Potassium carbonate—			
Calcined (K_2CO_3) 90%	lb.	.06	.06¼
Hydrated (KOH) 90%	lb.	.05½	.06¼
Potassium nitrate (KNO_3) (gran.)	lb.	.06½	.06¾
Potassium Permanganate ($KMnO_4$)	lb.	..	.15
Powdered blue	lb.	..	.26
Standard formula	lb.	..	.32
Salt cake, glassmakers (Na_2SO_4), f.o.b. works	ton	21.00-26.00	30.00-40.00
Selenium (Se)	lb.	..	2.20-2.35
Soda ash (Na_2CO_3) dense, 58%— f. o. b. works.			
Bulk, spot	Flat 100 lb.	1.40	..
Bulk, on contract	Flat 100 lb.	1.35	..
In 400 lb. bbls., on contract	100 lb.	1.69	..
In 300 lb. bags, on contract	100 lb.	1.45	..
Spot orders .05 per 100 lbs. higher.			
Sodium nitrate ($NaNO_3$), refined (Gran.) in bbls	lb.	.04¼	.04½
Sodium selenite (Na_2SeO_3)	lb.	..	2.00-2.50
Sodium Fluosilicate (Na_2SiF_6)	lb.	.07	.07¾
Sulphur (S)—			
Flowers, 155 lb. bbl. Per 100 lb.		3.35	3.65-3.90
Flowers, in bags	Per 100 lb.	3.00	3.30-3.55
Flour, heavy, in bbls.	Per 100 lb.	2.50	2.55-2.80
Uranium oxide (UO_3), 100 lb lots	lb.	..	2.00-2.50
Zinc oxide (ZnO)	lb.	.08	.08¼

Monthly Summary of United States Foreign Commerce in Glass

Exports

Corrected to February 25, 1924.

	January 1923 Quantity	January 1923 Value	January 1924 Quantity	January 1924 Value	Seven Months Ending January 1923 Quantity	Seven Months Ending January 1923 Value	Seven Months Ending January 1924 Quantity	Seven Months Ending January 1924 Value
Glass and glass products (total)	.....	$859,153	.....	$740,402	.....	$5,196,326	.....	$6,138,272
Plate and window glass—								
Window glass, common, box 50 sq. ft.	3,586	20,966	8,781	28,764	18,406	106,237	35,066	152,086
Plate glass, unsilvered, sq. ft.	225,249	85,909	198,761	64,346	1,227,510	471,323	912,993	385,934
Other window and plate glass, n.e.s. lbs.	495,073	42,379	266,719	22,378	1,513,241	156,954	1,475,014	161,974
Glass containers (bottles, vials and jars) lbs.	5,243,249	248,378	3,646,039	184,372	30,712,775	1,571,609	39,475,045	1,903,101
Table glassware, plain lbs.	1,608,378	192,849	1,261,162	150,937	10,185,171	1,077,498	11,809,296	1,348,042
Table and other glassware, cut or engraved lbs.	36,121	17,409	18,834	9,823	342,419	134,162	350,166	114,520
Glass for lighting—								
Lamp chimneys and lantern globes lbs.	141,078	25,650	169,651	33,560	805,628	153,773	1,200,512	226,480
Globes and shades for lighting fixtures lbs.	101,199	27,235	154,728	38,677	932,266	254,389	1,099,648	293,858
Lamps and other illuminating devices, chiefly of glass lbs.	107,643	31,562	118,752	35,291	607,412	192,582	928,953	222,955
Chemical glassware lbs.	12,339	10,071	14,793	13,050	117,502	78,869	161,043	111,661
Electrical glassware, except for lighting lbs.	191,789	15,332	167,377	17,154	1,748,453	111,818	1,435,424	106,137
Other glassware, n.e.s. lbs.	602,446	141,413	1,165,735	142,050	4,976,660	887,112	6,811,191	1,111,524

Imports

Corrected to February 25, 1924

		January 1923 Quantity	January 1923 Value	January 1924 Quantity	January 1924 Value	Seven Months Ending January 1923 Quantity	Seven Months Ending January 1923 Value	Seven Months Ending January 1924 Quantity	Seven Months Ending January 1924 Value
Glass (total)		.....	$1,502,288	.....	$1,489,391	.....	$9,757,072	.....	$15,641,111
Cylinder, crown, and sheet, lbs.	dut.	.....	.....	.....	.....	[1]12,319,638	[1]560,973	.....	.....
Unpolished, lbs.	dut.	3,037,521	135,732	2,217,731	116,304	[2]14,291,731	[2]633,208	22,755,834	1,105,530
Bent, ground, beveled, colored, painted, etc. and polished	dut.	.....	33,120	.....	47,435	.....	[2]242,408	.....	462,009
Plate glass—									
Unsilvered, sq. ft.	dut.	1,707,951	865,248	1,506,663	952,593	9,247,706	4,505,146	16,329,897	10,490,748
Fluted, rolled, etc., or silvered, or containing wire netting, sq. ft.	dut.	233,155	48,723	249,882	38,297	[3]756,744	[3]143,627	1,353,681	215,187
Containers—bottles, vials, etc.	dut.	.....	35,716	.....	20,659	.....	200,887	.....	85,070
Table and kitchen utensils, lbs.	dut.	58,699	21,772	64,803	9,160	[3]397,775	[3]151,856	524,455	115,170
Glassware, cut or decorated, lbs.	dut.	138,736	78,338	243,192	116,786	.....	1,139,713	2,384,510	1,030,502
Blown glassware, n. e. s., lbs.	dut.	414,504	69,870	.....	.....	[1]1,897,751	[2]440,011	[4]3,402,894	[4]881,319
Bottles, ornaments, etc., lbs.	dut.	.....	.....	153,984	60,668	.....	.....	[4]153,984	[4]60,668
Bulbs or electric lamps, lbs.	dut.	.....	.....	226,260	2,689	.....	.....	[4]226,260	[4]2,689
Chimneys, globes, shades, etc., lbs.	dut.	.....	.....	282,634	37,456	.....	.....	[4]282,634	[4]37,456
Articles and utensils for chemical, scientific, and experimental purposes, lbs.	dut.	.....	.....	56,238	19,504	.....	.....	[4]56,238	[4]19,504
Other glassware	free	.....	.....	.....	.....	[1]44,483	[1]44,253	.....	.....
	dut.	.....	213,769	.....	67,840	.....	1,694,990	.....	1,135,259

[1]July to Sept. 21, 1922. [2]Beginning Sept. 22, 1922. [3]July 1 to Dec. 31, 1923. [4]Beginning Jan. 1, 1924.